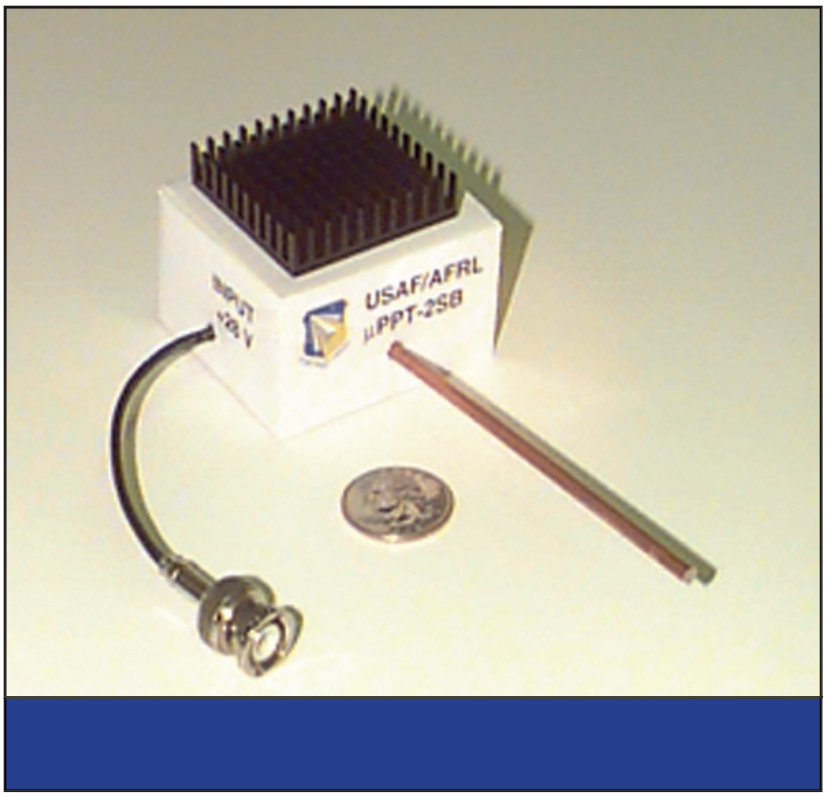
Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

MICRO-PULSED PLASMA THRUSTERS TO FLY ON AIR FORCE SATELLITES



Dr. Gregory Spanjers, a member of AFRL's electric propulsion group, recently invented a class of miniaturized electric propulsion thrusters called the micro-pulsed plasma thruster (MicroPPT). This thruster is capable of providing primary thrust for on-orbit operations as well as thrust required to change the satellite's orbit. Supported by the Air Force Office of Scientific Research's Aerospace and Materials Sciences Directorate, Dr. Spanjer's invention will enable future microsatellites to perform surveillance, on-orbit servicing, inspection, and space control.

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Accomplishment

Microsatellites are low-cost satellites weighing between 10-100 kilograms. In the future, scientists expect fleets of microsatellites, weighing about 25 kilograms and operating independently or in formation, to perform numerous space missions.

Dr. Spanjer's MicroPPT device produces thrust by using electromagnets to accelerate ionized propellant particles, which are ablated from the face or surface of the solid Teflon propellant. The solid propellant reduces the satellite weight and size by eliminating the propellant feed system. The use of electromagnetic acceleration to create thrust leads to a higher specific impulse (or thrust per unit propellant weight) for the thruster as compared to chemical propulsion systems.

Background

The MicroPPT evolved from a radical reengineering of the pulsed plasma thruster originally developed in the 1970s. By removing all nonessential hardware and simplifying the electronics, the MicroPPT represents improvements that are about 50 times greater than capabilities of current, state-of-the-art designs. The finished product weighs only 660 grams, while some experimental lab models weigh even less—well under 100 grams.

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Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (02-OSR-07)